

# PUNISH ONCE OR PUNISH TWICE: A THEORY OF THE USE OF CRIMINAL SANCTIONS IN ADDITION TO REGULATORY PENALTIES

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## Abstract

Though clearly distinct in nature and procedure, both Regulatory Agencies and Courts frequently rely on similar instruments to sanction the same or very similar kinds of illegal behavior. In this paper, we develop a theory of the use of criminal sanctions in addition to regulatory penalties. We show that it is generally more effective to have a penalty imposed by a Regulatory Agency rather than by the Courts. We extend our analysis by considering imprisonment sentences, legal error, and collusion between a Regulatory Agency and an offender. We claim that regulatory penalties become less effective in these contexts. The objective of the paper, though, is not limited to the determination of the theoretical conditions that can make the use of both sanctioning schemes optimal. Our analysis is also relevant to the application of a specific legal doctrine, the Double Jeopardy clause.

Keywords: Economics of Law Enforcement, Regulatory Agency, Courts, Double Jeopardy.

JEL Classification: K4

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# PUNISH ONCE OR PUNISH TWICE: A THEORY OF THE USE OF CRIMINAL SANCTIONS IN ADDITION TO REGULATORY PENALTIES

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# 1 Introduction

In order to deter undesirable behavior by individuals and firms, legal systems delegate powers to sanction upon different decision-making bodies, Regulatory Agencies and Courts as paramount examples. Though clearly distinct in nature and procedure, both Agencies and Courts frequently rely on similar instruments to sanction the same or very similar kinds of illegal behavior.

Agencies operating in certain areas -environmental protection, workplace safety and health, banking and financial intermediation, transport safety, just to cite a few- commonly have authority to assess and collect monetary penalties for regulatory violations detected within their statutory mandate. For instance, EPA can impose penalties up to \$10,000 per day, with a maximum of \$125,000<sup>1</sup> on anyone discharging pollutants into a river in violation of the Clean Water Act.

In turn, many of those regulatory violations are also held criminal offenses<sup>2</sup>, and consequently, subject to criminal punishment -in the form of fines and/or imprisonment-. Punishment which will be, naturally, decided and enforced by the Courts. For instance, the knowing discharge of pollutants into navigable waters is a felony punishable by fine of \$5,000 to \$50,000 per day, and by imprisonment of up to 3 years.<sup>3</sup> It is true that, for a criminal conviction to take place, the underlying behavior has ordinarily to be qualified in terms of the state of mind of the offender -needs to be willful, in most cases<sup>4</sup>-,

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<sup>1</sup>Sec. 1319(g), Clean Water Act. The maximum size of the penalty is dependent on the type of procedure -with or without adjudicatory hearings- followed by the Agency. The amount shown in the text is the upper limit given that hearings have been conducted.

<sup>2</sup>In what follows, we will disregard the distinction -relevant in American Law for the proof of evil intent, and for the result qualifications of the violation- between statutory and common law crimes. We will assume throughout the paper that the regulatory violation is considered a crime in the relevant Statute. The distinction is unknown in Europe due to the strict “legality principle” governing criminal law.

<sup>3</sup>Sec. 1319(c), Clean Water Act. A simply negligent discharge is also punishable as a crime, though less severely.

<sup>4</sup>The willfulness requirement is common, but not necessary, as the previous footnote shows. Even if unnecessary for criminal punishment as such, it increases the size of the sanction. In the field of environmental crimes there has been substantial debate concerning the required state of mind of the offender -what a knowing violation means-. See Percival et al. (2000).

or accompanied by a harmful result.<sup>5</sup> The universe of regulatory violations in a certain area, thus, does not exactly match -that is, is larger than- the universe of criminal offenses in that same area. What is important, though, is that for a significant fraction of regulatory violations, in addition to the penalties imposed by the relevant Regulatory Agency, criminal law provides for a second sanction that will be imposed by the Courts.

This prevalent and, at first sight, puzzling feature of most regulatory and legal systems has remained largely unnoticed in the literature.<sup>6</sup> To our knowledge, this paper is the first attempt to offer a rigorous economic theory of the combined use of regulatory penalties and criminal sanctions to deter the same underlying illegal behavior. We explore the reasons for the preference of one over the other as well as possible rationales for using both sets of sanctions. We show that, apart from the obvious case in which the regulatory fine cannot be optimal due to the wealth constraint of the offender and, thus, imprisonment is required for deterrence<sup>7</sup>, the possibility of legal error and collusion between the Agency and the offender might, under certain limited conditions, justify the observed legal dichotomy, and the imposition of a criminal sanction on top of a regulatory penalty.

Our model follows the standard law enforcement literature (Garoupa 1997, Polinsky and Shavell 2000). We consider the possibility that each offender can be sanctioned by a Regulatory Agency and by the Courts. The regulatory penalty and the criminal sanction are both monetary fines. Given socially optimal enforcement effort, we argue that it is more effective to fine offenders by a Regulatory Agency rather than by the Courts. The rationale for this result is that a regulatory penalty is less costly and entails a higher probability of effective sanction for the offender, due to a lower burden of

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<sup>5</sup>Under the *Occupational Safety and Health Act*, to be punishable as a crime, the regulatory violation has to result in death of a person, or in interference with *OSHA* inspections or activities -false reports, etc-.

<sup>6</sup>Even among the legal commentators, the attention devoted to this apparent duplication of sanctions has been remarkably scarce. Only its relevance for the scope of the Double Jeopardy clause (on which more below), has been considered. But even with regard to the cases in which Double Jeopardy was the issue, discussions have shown little theoretical thrust.

<sup>7</sup>This is just a special case of the more general rationale for using imprisonment as punishment. See Polinsky and Shavell (1984, 2000).

proof and disregard for mental states of the offender.

Nevertheless, when, for whatever reason, the socially optimal level of enforcement effort is not achievable by a Regulatory Agency, there is a possibility that a criminal sanction could play a role at controlling regulatory under-enforcement.

We extend our analysis by considering imprisonment sentences (section three), legal error (section four), and collusion between a Regulatory Agency and an offender (section five). Regulatory penalties become less appealing in these contexts.

Monetary fines are limited by wealth. Thus, an imprisonment sentence (or any other form of nonmonetary sanction) could be required to achieve optimal deterrence. A Regulatory Agency cannot impose an imprisonment sentence. Consequently, a criminal sanction is needed.

When we consider the possibility of legal error (convicting the innocent), a higher probability of effective sanction by the Regulatory Agency causes two problems. First, deterrence is reduced because the opportunity cost of becoming an offender is smaller (since an honest individual can be detected and sanctioned). The deterrence advantage exhibited by regulatory penalties does not necessarily hold when there is the possibility of legal error. Second, even for purely monetary sanctions, there might be a social cost of punishing the innocent, of miscarriage of justice: the unjustly sanctioned loose reputation and the citizenship to some extent demoralizes. It is clear to us, though, that given there has been a legal error, the social costs from criminal sanction exceed those from the regulatory penalty. However, since it is more likely that a Regulatory Agency sanctions the innocent than a Court of Law, the expected social cost of miscarriage of justice could be higher in the first than in the second case.

When the regulatory penalty is larger than the reward collected by the Agency, there is the possibility of collusion. If collusion takes place, the penalty suffered by offenders is too low (since the bribe will be less than what the regulatory penalty should be). Deterrence is reduced. A criminal sanction should be introduced to offset this effect.

A collusion-proof solution is investigated. The reward collected by the Agency equals the regulatory penalty to eliminate the possibility of collusion. Thus, the reward collected by the Agency is larger than the socially optimal reward (since this one is less than the regulatory penalty). An implication of this observation is that there will be over-enforcement by the Regulatory Agency. By introducing a criminal sanction, more individuals are deterred. If more individuals are deterred, the total reward collected by the Agency is reduced (because there are fewer offenders), and so the Agency will reduce enforcement.

Criminal prosecution of regulatory offenses generates information that is helpful to the Agency's watchdog. It makes detection of collusion or unlawful behavior by the Agency easier to detect and sanction. In other words, a Regulatory Agency will be more deterred from engaging in collusion if regulatory offenses can be criminally prosecuted (since there is a higher likelihood of detection of collusion). In a similar context, Jost (1997) has argued that the possibility that offenders can appeal to a Court of Law after being penalized by a Regulatory Agency increases monitoring costs (because the appeal makes regulatory enforcement more costly since the Agency has to investigate the same offense twice). The positive effect is that an Agency will perform a better job to avoid appeals.

The objective of the paper, though, is not limited to the determination of the theoretical conditions that can make the use of both sanctioning schemes optimal. Our analysis is also relevant to the application of a specific legal doctrine, the Double Jeopardy clause. Most western legal systems recognize, from time immemorial, the principle known as *Non bis in idem* or *Ne bis in idem* in the Continental European legal tradition, and as Double Jeopardy in the US. The principle, simply stated, guarantees that no one should be punished twice for the same offence. This protection against double or multiple punishment has explicit recognition at the Constitutional level in some countries (US, Germany), whereas in others the Courts have acknowledged its standing as an implicit Constitutional right (Italy, Spain).

The Double Jeopardy clause<sup>8</sup> will be violated if the penalties imposed

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<sup>8</sup>Double Jeopardy presents other implications that do not touch the object of this paper. For instance, in the US the Supreme Court has ruled that it determines asymmetric appeal

by the Agency, though non-criminal by definition, qualify as “punishment” for the purposes of the scope of the *Non bis in idem* principle. The imposition of penalties by the Agency, then, would bar any criminal conviction and sanction, and vice versa. The US Supreme Court<sup>9</sup> and other Constitutional Courts<sup>10</sup> have been struggling with this issue, and alternating between granting or denying Double Jeopardy protection in these -highly likely, in terms of occurrence- circumstances. Our analysis, we believe, sheds new light upon the meaning of Double Jeopardy in this context and points out at some factors that Courts should look at when deciding the scope of the Double Jeopardy clause with respect to -nominally, at least-. non-criminal sanctions.

In many circumstances, regulatory penalties are also coupled with civil penalties.<sup>11</sup> Our analysis conceptually applies with respect to the optimality of regulatory penalties and civil penalties. However, one should emphasize that a regulatory penalty’s advantage in deterrence is less evident because the burden of proof for a civil penalty is no longer reasonable doubt, but preponderance of the evidence, and mental states are less important. Yet, a civil case is usually more expensive and more time consuming than regulatory hearings.

## 2 Basic Model

As in the usual Polinsky and Shavell (2000) framework, we start by assuming that each risk-neutral individual chooses whether to commit an offense, for example, an environmental regulation violation. The offender’s gain from committing the offense is  $b$ , which is distributed across the population according to a probability density function  $g(b)$  and a cumulative distribution

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rights for the prosecution and the defense in criminal cases. See for example Khanna (1999). In Continental Europe, it does not imply differentiated appeal rights, but has other procedural consequences (prevents an Agency from intervening in any way in a case that is being investigated by a Judge).

<sup>9</sup> *US v. Halper* (1987), *US v. Ursery* (1996), *Hudson v. US* (1997).

<sup>10</sup> Spanish Constitutional Court, Sentencia xxx/1999, dated of 11th October 1999.

<sup>11</sup> For example, sec. 1319, Clean Water Act.

function  $G(b)$ , where  $b \in [0, \bar{b}]$ , and  $g'(b) \geq 0$ . The fraction of individuals deriving benefits less than  $b$  from the crime is  $G(b)$ . The size of the population is normalized to one.

Each offense generates a social damage given by  $h$ . The net social harm from the crime is  $h - b$  (we take the usual view that the illegal gain is a social gain), where  $h < \bar{b}$ .

The enforcement or Regulatory Agency invests  $m$  on investigating and monitoring individuals and gathering evidence about the act committed by an offender. Each offender is detected and sanctioned by the Regulatory Agency with probability  $p(m)$ . Offenders can also be brought before Court and convicted with probability  $q(m)$ , where  $p(m) > q(m)$ ,  $p_m > q_m > 0$ ,  $p_{mm} < 0$  and  $q_{mm} < 0$ . Most of these assumptions are self-explanatory. Given the Agency's enforcement effort, the probability of conviction by the Regulatory Agency is higher than that by a Court because (a) costs are lower for the Regulatory Agency than for the Courts (the sanctioning procedure of the Regulatory Agency is speedier and cheaper than a criminal trial), (b) the burden of proof is lower for imposing a regulatory penalty than for a criminal conviction in Court ("beyond reasonable doubt" would be the burden of persuasion required for a criminal conviction, whereas one would expect the "preponderance of the evidence" to suffice for a regulatory penalty), and (c) states of mind are relevant for criminal conviction but usually they do not matter for imposing regulatory penalties.

An Agency imposes a penalty  $f$  and Courts impose a sanction  $s$ ; total wealth is  $S$  so that  $f + s \leq S$ . Penalty and sanction are both monetary fines assumed to be costless to collect. For each detected and sanctioned offender, the Agency is paid a reward  $\gamma$  by the Government.

Each potential offender decides to become an offender if  $b \geq p(m)f + q(m)s$ . Let's denote the expected sanction as  $z$ .

The Regulatory Agency is assumed to behave as a profit-maximizing firm. The expected profits are:

$$\Pi = \int_z^{\bar{b}} p(m)\gamma dG(b) - m$$



The optimal  $m$  is decided by the Agency so that:

$$\Pi_m = p_m \gamma [1 - G(z)] - p(m) \gamma g(z) z_m - 1 = 0$$

where the first term is the marginal revenue from spending more on detection, and the second term measures the marginal loss of more individuals being deterred (reducing profits).

Assuming the second-order condition is satisfied, it can be easily checked that the optimal  $m$  is increasing in reward  $\gamma$ , and decreasing in the penalty  $f$  and sanction  $s$ .

Social welfare is the sum of illegal gains minus social damage minus enforcement costs, as in the usual Polinsky and Shavell (2000) framework:

$$W = \int_z^{\bar{b}} (b - h) dG(b) - m$$

The social objective is to choose  $\gamma$ ,  $f$ , and  $s$  to maximize the above expression condition on the Agency's choice of  $m$  (enforcement technology) and on total wealth (where  $\lambda$  is the associated Lagrangean multiplier):

$$\mathcal{L} = \int_z^{\bar{b}} (b - h) dG(b) - m + \lambda(S - f - s)$$

The first-order conditions are:

$$\mathcal{L}_\gamma = W_m m_\gamma = 0 \tag{1}$$

$$\mathcal{L}_f = (h - z)g(z)p(m) + W_m m_f - \lambda \leq 0 \tag{2}$$

$$\mathcal{L}_s = (h - z)g(z)q(m) + W_m m_s - \lambda \leq 0 \tag{3}$$

where:

$$W_m = (h - z)g(z)(p_m f + q_m s) - 1 = 0 \tag{4}$$

Second-order conditions are assumed to be satisfied. From (1), the reward is set so that the Agency's enforcement effort  $m$  is socially optimal ( $W_m = 0$ ). By choosing the appropriate reward, the policymaker can delegate the socially optimal enforcement effort to a private Agency. Note that

from (4), it is the case that  $z < h$ , that is, the expected sanction is less than the harm.

Given the assumption that  $p(m) > q(m)$  for all  $m$ , the first-order conditions can only be satisfied by setting  $f = S$  and  $s = 0$ . The reasoning is that, given socially optimal enforcement effort  $m$ , it is more effective to fine offenders by the Regulatory Agency rather than by the Courts, because the first is less costly and entails a higher probability of effective sanction for the offender, due to a lower burden of proof and disregard for mental states of the offender.

It is well known from Polinsky (1980) that sometimes it is not possible to delegate the socially optimal  $m$  because is simply too high for the Agency. Suppose complete deterrence is the socially optimal solution. The Agency's expected profits are zero at this deterrence level. Thus, it will surely choose enforcement effort seeking less than socially optimal deterrence.

When the socially optimal effort cannot be delegated, the Regulatory Agency always chooses less than optimal enforcement effort even if the reward is very large ( $W_m > 0$ ). Thus, the penalty to be imposed by the Agency could be less than maximal because by lowering the sanction, the Agency is willing to spend more on detection (recall that  $m_f < 0$ ). At the same time, the criminal sanction is not necessarily positive for the same reason (i.e., we have  $m_s < 0$ ).

From (2) and (4), given the assumption that  $p(m) > q(m)$  for all  $m$ , the optimal policy will depend on the relationship between  $m_f$  and  $m_s$ . Using the implicit function theorem, let us write:

$$\begin{aligned} m_f - m_s &= (\Pi_{ms} - \Pi_{mf})/\Pi_{mm} \\ &= [p_m \gamma g(z)(p(m) - q(m)) + p(m) \gamma g(z)(p_m - q_m) \\ &\quad + p(m) \gamma g'(z) z_m (p(m) - q(m))]/\Pi_{mm} < 0 \end{aligned}$$

We have shown before that a regulatory penalty is more effective in deterring offenders. Now we have shown that a regulatory penalty is more effective as a policy instrument to induce the Agency to increase detection (recall that the Government wants the Agency to increase detection since  $W_m > 0$ ).

These two effects have different policy implications. The first effect pushes the regulatory penalty up, whereas the second pushes it down (so that the Agency is willing to spend more on detection). Notice in (2) and (3) that the first term is positive whereas the second is negative generating the possibility of interior solutions. There are three possibilities to consider:

$$(a) (h - z)g(z)(p(m) - q(m)) + W_m(m_f - m_s) > 0.$$

The first term measures the relative value of the regulatory and criminal fines in deterring offenders. The second term measures the relative value of these fines as policy instruments to induce the Agency to increase detection.

A regulatory penalty is still socially more desirable than a criminal sanction due to its advantage in terms of efficient deterrence. From (2), the regulatory penalty could be less than maximal (to avoid under-enforcement), but the criminal sanction should be zero.

$$(b) (h - z)g(z)(p(m) - q(m)) + W_m(m_f - m_s) < 0.$$

The criminal sanction is now socially more desirable than the regulatory penalty. The criminal sanction could be less than maximal (to avoid under-enforcement), but the regulatory penalty should be zero. The role of the penalty as an instrument to induce the Agency to increase detection is so important that, notwithstanding its deterrence advantage, the optimal regulatory penalty is zero.

$$(c) (h - z)g(z)(p(m) - q(m)) + W_m(m_f - m_s) = 0.$$

Both sanctions have the same social value. They are eventually less than maximal (to avoid under-enforcement), and both sanctions could be positive, so that  $0 < f + s \leq S$ . The regulatory fine goes down motivated by the need to generate an appropriate incentive for the Agency to increase detection. The criminal fine could go up to offset the effect on deterrence.

In the rest of this paper we assume that the socially optimal enforcement effort can always be delegated (i.e., complete deterrence is not socially optimal). In essence we are assuming that social damage  $h$  is not too high for a given distribution of illegal gains. When social damage is high, given the delegation problems, the policymaker should use non-profit maximizing

enforcers (what has been called in the literature “public enforcers”) rather than Regulatory Agencies.<sup>12</sup>

### 3 Model with Imprisonment

Following Polinsky and Shavell (1984), suppose the criminal sanction  $s$  is the monetary equivalent of an incarceration sentence or any other form of non-monetary sanction. The social cost of imposing incarceration is  $C(s)$ , where  $C' > 0$  and  $C'' > 0$ . It includes the offender’s cost of being incarcerated.

Social welfare is given by:

$$W = \int_z^{\bar{b}} (b - h - qC(s))dG(b) - m$$

The social objective is to choose  $\gamma$ ,  $f$ , and  $s$  to maximize the above expression condition on the Agency’s choice of  $m$  (enforcement technology) and on total wealth (where  $\lambda$  is the associated Lagrangean multiplier):

$$\mathcal{L} = \int_z^{\bar{b}} (b - h - qC(s))dG(b) - m + \lambda(S - f)$$

The first-order conditions are:

$$\mathcal{L}_\gamma = W_m m_\gamma = 0 \tag{5}$$

$$\mathcal{L}_f = (h + qC(s) - z)g(z)p(m) + W_m m_f - \lambda \leq 0 \tag{6}$$

$$\mathcal{L}_s = (h + qC(s) - z)g(z)q(m) - \int_z^{\bar{b}} qC'(\cdot)dG(b) + W_m m_s \leq 0 \tag{7}$$

where:

$$W_m = (h + qC(s) - z)g(z)(p_m f + q_m s) - \int_z^{\bar{b}} C(\cdot)dG(b) - 1 = 0 \tag{8}$$

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<sup>12</sup>See Polinsky (1980) and Garoupa and Klerman (2000) for a discussion about private versus public (non-profit maximizing) enforcement.

Second-order conditions are assumed to be satisfied. As before, the reward is set so that the Agency's enforcement effort  $m$  is socially optimal ( $W_m = 0$ ). From (8), it is the case that  $z < h + qC(s)$ , that is, the expected sanction is less than the harm. From (6), the first-order condition can only be satisfied by setting  $f = S$ .

The first term in (7) expresses the marginal gain from using incarceration (the marginal value of increasing deterrence), and the second term in (7) is the marginal cost from using incarceration. We can rearrange (7) into:

$$\mathcal{L}_s = \lambda q(m)/p(m) - qC'(\cdot)(1 - G(z)) \leq 0$$

The marginal gain from using incarceration increases with  $\lambda$ , the shadow cost of the regulatory penalty. As wealth increases, the shadow cost of the regulatory penalty decreases, and so does the marginal gain from using incarceration. Therefore, incarceration should be used when offenders have relatively fewer assets.

## 4 Model with Legal Error

So far we have considered Type II errors, that is, not punishing the guilty (with probability  $(1 - p(m))(1 - q(m))$ ). Suppose Type I errors, punishing or convicting innocent individuals, could happen. Let us assume that the probability of the Regulatory Agency convicting the innocent is  $p'(m)$ , and the probability of a Court convicting the innocent is  $q'(m)$ . Whereas the payoff of an offender is  $b - p(m)f - q(m)s$  as before, the payoff of an innocent is  $-p'(m)f - q'(m)s$  where  $p(m) \geq p'(m)$  and  $q(m) \geq q'(m)$ , that is, the probability of convicting the guilty is higher than that of the innocent.

Denote  $(p(m) - p'(m)) - (q(m) - q'(m))$  by  $\psi(m)$ . Even though we assume  $p(m) > q(m)$  and  $p'(m) > q'(m)$ , that is, it is more likely that the Regulatory Agency will sanction (the guilty as much as the innocent) than for the Courts, it is not necessarily true that  $p(m) - q(m) > p'(m) - q'(m)$  or  $p(m) - p'(m) > q(m) - q'(m)$ , i.e.  $\psi(m)$  can be positive or negative. Consider an extreme example where  $p(m) = p'(m) = 1$ ,  $q(m) = 1/2$  and  $q'(m) = 0$ . It is clear that the last inequality is not satisfied ( $\psi = -1/2$ ).

Define  $z$  as  $(p(m) - p'(m))f + (q(m) - q'(m))s$ . The expected profits for the Agency are:

$$\Pi = \int_0^z p'(m)\gamma dG(b) + \int_z^{\bar{b}} p(m)\gamma dG(b) - m \quad (9)$$

where the first term measures the revenues from convicting innocent individuals.

The optimal  $m$  is decided by the Agency so that:

$$\Pi_m = p'_m\gamma G(z) + p_m\gamma[1 - G(z)] - (p(m) - p'(m))\gamma g(z)z_m - 1 = 0 \quad (10)$$

It can be easily checked that the comparative statics are the same as in the basic model.

Given the assumptions above, the aggregate social welfare is:

$$W = \int_z^{\bar{b}} (b - h)dG(b) - m \quad (11)$$

where for the present specification a cost of miscarriage of justice is ignored. In other words, legal error has no direct social cost; it only reduces deterrence.

The first-order conditions are:

$$\mathcal{L}_\gamma = W_m m_\gamma = 0 \quad (12)$$

$$\mathcal{L}_f = (h - z)g(z)[p(m) - p'(m)] + W_m m_f - \lambda \leq 0 \quad (13)$$

$$\mathcal{L}_s = (h - z)g(z)[q(m) - q'(m)] + W_m m_s - \lambda \leq 0 \quad (14)$$

where

$$W_m = (h - z)g(z)[(p_m - p'_m)f + (q_m - q'_m)s] - 1 = 0 \quad (15)$$

As before, second-order conditions are assumed to be satisfied, and the Government uses  $\gamma$  to delegate the socially optimal enforcement expenditure.

Compared with previous results, we will have  $f = S$  and  $s = 0$  if  $\psi(m) > 0$ , and  $s = S$  and  $f = 0$  if  $\psi(m) < 0$ . If  $\psi(m) = 0$ , any  $f$  and  $s$  such that  $f + s = S$  is optimal. The intuition is that the Agency is more effective

in sanctioning an offender but also in punishing an innocent. The net effect on deterrence is thus not straightforward. And this net effect (as measured by  $\psi(m)$ ) decides the optimal policy.

Following Miceli (1991), let us include a cost of miscarriage of justice of the form  $\sigma(p'(m)f + q'(m)s)$ . Note that we assume that the social cost of legal error is the same if caused by the Agency or by a Court of Law.<sup>13</sup> The aggregate social welfare is:

$$W = \int_z^{\bar{b}} (b - h) dG(b) - \int_0^z \sigma(p'(m)f + q'(m)s) dG(b) - m \quad (16)$$

In this specification, legal error has a social cost. It makes punishment socially costly. The first-order conditions are:

$$\mathcal{L}_\gamma = W_m m_\gamma = 0 \quad (17)$$

$$\begin{aligned} \mathcal{L}_f &= (h - z)g(z)[p(m) - p'(m)] - \int_0^z \sigma p'(m) dG(b) \\ &\quad - \sigma(p'(m)f + q'(m)s)(p(m) - p'(m)) + W_m m_f - \lambda \leq 0 \end{aligned} \quad (18)$$

$$\begin{aligned} \mathcal{L}_s &= (h - z)g(z)[q(m) - q'(m)] - \int_0^z \sigma q'(m) dG(b) \\ &\quad - \sigma(p'(m)f + q'(m)s)(q(m) - q'(m)) + W_m m_s - \lambda \leq 0 \end{aligned} \quad (19)$$

where

$$\begin{aligned} W_m &= (h - z)g(z)[(p_m - p'_m)f + (q_m - q'_m)s] - \int_0^z \sigma(p'_m f + q'_m s) dG(b) \\ &\quad - \sigma(p'(m)f + q'(m)s)[(p_m - p'_m)f + (q_m - q'_m)s] - 1 = 0 \end{aligned} \quad (20)$$

Again, as before, second-order conditions are assumed to be satisfied and the Government uses  $\gamma$  to delegate the socially optimal enforcement expenditure. From (18) and (19), we may have less than maximal fines

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<sup>13</sup>We recognize that the cost of miscarriage is usually lower if an innocent is sanctioned by the Regulatory Agency rather than by the Courts. We could consider  $\sigma_s > \sigma_f$ , but the analytical conditions would be very similar to the ones we discuss below. See Kahan (1997) and Posner (2000) for discussion.

because of the marginal cost of miscarriage of justice. Social welfare is not strictly increasing in the fines. As to optimal sanctioning, there are three possibilities to be considered:

$$(a) \quad (h - z)g(z)\psi(m) > \int_0^z \sigma(p'(m) - q'(m))dG(b) \\ + \sigma(p'(m)f + q'(m)s)\psi(m).$$

On the left-hand-side, we consider the relative deterrence effect of both fines. On the right-hand-side, we have the relative effect of fines on the cost of miscarriage of justice.

In this case, a regulatory penalty is socially more desirable than a criminal sanction. From (18), the regulatory penalty could be less than maximal (to avoid a high cost of miscarriage of justice), but the criminal sanction should be zero. A regulatory penalty, notwithstanding its disadvantage in terms of miscarriage of justice, is always more efficient than a criminal sanction.

$$(b) \quad (h - z)g(z)\psi(m) < \int_0^z \sigma(p'(m) - q'(m))dG(b) \\ + \sigma(p'(m)f + q'(m)s)\psi(m).$$

Under this condition, a regulatory penalty is socially less desirable than a criminal sanction. From (19), the criminal sanction could be less than maximal (to avoid a high cost of miscarriage of justice), but the regulatory penalty should be zero. A criminal fine is now always more efficient than a regulatory penalty due to its beneficial effect on avoiding legal error.

$$(c) \quad (h - z)g(z)\psi(m) = \int_0^z \sigma(p'(m) - q'(m))dG(b) \\ + \sigma(p'(m)f + q'(m)s)\psi(m).$$



Both sanctions are equally socially desirable. They are eventually less than maximal (to avoid a high cost of miscarriage of justice )and both sanctions could be positive, so that  $0 < f + s \leq S$ . A possibility is that the regulatory penalty goes down motivated by high cost of miscarriage of justice. The criminal sanction goes up for deterrence sake.

Note that when  $\sigma = 0$ , there are only two possibilities: (a) and (b), unless a particular case such that  $\psi(m) = 0$  takes place (which would correspond to (c)). The existence of a cost of miscarriage of justice increases the likelihood of a regulatory penalty coexisting with a criminal sanction. The intuition is that even though the Agency is still more effective, the cost of miscarriage increases more when using the Agency as the sanctioning body.

## 5 Model with Collusion

Consider the results obtained in the basic model. When the reward differs from the penalty, there is a possibility that the Regulatory Agency colludes with offenders, by form of bribing (if the penalty is higher than the reward) or by form of fabricating offenses (if the penalty is less than the reward). In this section we will discuss in detail the case of bribing and make some brief comments about fabrication of offenses at the end of the section.

Let us assume that the penalty is higher than the reward. In other words, it is assumed that the reward derived in section two (i.e., the reward required to delegate the socially optimal enforcement effort) is low. The Agency and the offender collude and the bribe is given by  $(f + \gamma)/2$ , where each player has the same bargaining power. The expected sanction is now:

$$z = p(m)(f + \gamma)/2 + q(m)s$$

The expected profits for the Regulatory Agency are:

$$\Pi = \int_z^{\bar{b}} p(m)(f + \gamma)/2 dG(b) - m$$

The optimal  $m$  is decided by the Agency so that:

$$\Pi_m = p_m(f + \gamma)/2[1 - G(z)] - p(m)(f + \gamma)/2g(z)z_m - 1 = 0$$

Assuming the second-order condition is satisfied, it can be easily checked that the optimal  $m$  is no longer monotonically increasing in reward  $\gamma$ , and monotonically decreasing in the penalty  $f$ . The reason is that a higher reward deters more offenders (because the bribe is higher), and a fine increases the gain for the Agency (by generating a larger bribe).

Social welfare is the sum of illegal gains minus social damage minus enforcement costs:

$$W = \int_z^{\bar{b}} (b - h)dG(b) - m$$

The Lagrangean is:

$$\mathcal{L} = \int_z^{\bar{b}} (b - h)dG(b) - m + \lambda(S - f - s)$$

The first-order conditions are:

$$\mathcal{L}_\gamma = (h - z)g(z)p(m)/2 + W_m m_\gamma = 0 \quad (21)$$

$$\mathcal{L}_f = (h - z)g(z)p(m)/2 + W_m m_f - \lambda \leq 0 \quad (22)$$

$$\mathcal{L}_s = (h - z)g(z)q(m) + W_m m_s - \lambda \leq 0 \quad (23)$$

where:

$$W_m = (h - z)g(z)[p_m(f + \gamma)/2 + q_m s] - 1 = 0 \quad (24)$$

Second-order conditions are assumed to be satisfied. From (21), the reward is no longer set so that the Agency's enforcement effort  $m$  is socially optimal ( $W_m = 0$ ). The reason is that a higher reward is needed now because it is a deterrence instrument (first term in (21)). Recall that, in absence of collusion, the reward is low. The consequence of a higher reward is that the Agency's enforcement effort will be above the socially optimal ( $W_m < 0$ ).

From (23), it is clear that social welfare is strictly increasing in the criminal sanction. However, from (22), the same result does not hold for the regulatory penalty. If  $m_f > 0$ , that is, if enforcement increases with the regulatory penalty (because it increases the bribe), the second term is negative.

There are three possible situations:

$$(a) (h - z)g(z)(p(m)/2 - q(m)) + W_m(m_f - m_s) > 0.$$

The first term measures the relative value of these fines in deterring offenders. The second term measures the relative value of these fines as policy instruments to induce the Agency to increase detection. The first term is not necessarily positive (because of collusion), and the sign of second term depends on the parameters of the model. We know that  $W_m$  is negative, but the sign of  $m_f - m_s$  could be positive or negative. In section two, we have shown that  $m_f - m_s$  was negative, but now could be positive because of bribing (recall that the regulatory penalty also plays the role of reward now).

In order to satisfy this condition it must be case that at least one of the following is true:  $p(m) > 2q(m)$  (a regulatory penalty is more effective as a deterrent than a criminal sanction when bribing takes place) or  $m_f - m_s < 0$  (a regulatory penalty is more effective in controlling for over-enforcement than a criminal sanction). A regulatory penalty is still socially more desirable than a criminal sanction. The optimal policy is to set  $f = S$  and  $s = 0$ .

$$(b) (h - z)g(z)(p(m)/2 - q(m)) + W_m(m_f - m_s) < 0.$$

In order to satisfy this condition it must be case that at least one of the following is true:  $p(m) < 2q(m)$  (a criminal sanction is more effective as a deterrent than a regulatory penalty because of bribing) or  $m_f - m_s > 0$  (a criminal sanction is more effective in controlling for over-enforcement than a regulatory penalty). A criminal sanction is now socially more desirable than a regulatory penalty. We could be tempted to argue that the optimal policy should be  $f = 0$  and  $s = S$ . However recall that we are assuming that  $f > \gamma$ . So the optimal policy would be  $f = \gamma + \epsilon$  and  $s = S - \gamma - \epsilon$ , where  $\epsilon$  is

arbitrarily small.<sup>14</sup>

$$(c) (h - z)g(z)(p(m) - q(m)) + W_m(2m_f - m_s) = 0.$$

Both sanctions have the same social value. From (22), we could have  $f < S$  (to avoid over-enforcement) and  $s = S - f$  (for deterrence sake).

Collusion diminishes deterrence. As a consequence, the Government should increase the Agency's reward so that the bribe increases. This policy leads to over-enforcement. Thus, the Government may want to reduce the regulatory penalty to reduce over-enforcement (if the relationship between enforcement and regulatory penalty is positive). In order to offset the effect on deterrence, a criminal sanction should be introduced.

## 5.1 Collusion-Proof Solution

From Becker and Stigler (1974), we should have  $\gamma = f$  to eliminate incentives for corruption. The reward collected by the Regulatory Agency should be exactly equal to the penalty paid by the detected offender to generate a collusion-proof solution.<sup>15</sup> This rule of course constraints the optimization problem, and social welfare will be necessarily lower than in section two (unless for some pure coincidence  $\gamma = S$  in section two).

The social objective is now to choose  $f$  and  $s$  to maximize social welfare condition on the Agency's choice of  $m$  (enforcement technology), on total wealth, and on the reward being equal to the penalty imposed by the Regulatory Agency.

The first-order conditions are:

$$\mathcal{L}_f = (h - z)g(z)p(m) + W_m(m_f + m_\gamma) - \lambda \leq 0 \quad (25)$$

$$\mathcal{L}_s = (h - z)g(z)q(m) + W_m m_s - \lambda \leq 0 \quad (26)$$

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<sup>14</sup>Note that when  $\epsilon = 0$ , collusion is eliminated. It introduces a discontinuity in the objective function. This solution is analyzed in the next subsection.

<sup>15</sup>See Bowles and Garoupa (1997) and Polinsky and Shavell (2001) for discussion. A collusion-proof solution is the optimal solution if the objective of the government is to completely eliminate corruption.

As usual, second-order conditions are assumed to be satisfied.

The reward is no longer optimal because it must equal the regulatory penalty to generate a collusion-proof solution. If optimal  $\gamma$  is less than  $S$ , the reward will have to go up and the sanction will have to go down. Thus,  $W_m$  will be negative meaning that too much is spent on detection (over-enforcement).

From (26), the first and the second term are positive, so that social welfare is increasing in the criminal sanction. From (25), the first term is positive, but the second term could be negative. Social welfare is not necessarily increasing in the regulatory penalty.

In order to evaluate policies, let us start by writing:

$$\begin{aligned}\tau &= m_f + m_\gamma - m_s = (\Pi_{ms} - \Pi_{mf} - \Pi_{m\gamma})/\Pi_{mm} \\ &= [p_m\gamma g(z)(p(m) - q(m)) + p(m)\gamma g(z)(p_m - q_m) \\ &\quad + p(m)\gamma g'(z)z_m(p(m) - q(m)) - p_m(1 - G(z)) + p_m g(z)z_m]/\Pi_{mm}\end{aligned}$$

It is the case that  $\tau$  could be negative or positive. We also know from section two that  $m_f - m_s$  is negative. If we have a positive  $\tau$ , the effect of the reward on enforcement ( $m_\gamma$ ) more than offsets the effect of fines on enforcement ( $m_f - m_s$ ). Conversely, if negative, the effect of fines more than offsets the reward effect on Agency's enforcement effort.

It has been assumed that the regulatory penalty is more effective in deterring offenders. We also know that the regulatory penalty affects collusion, whereas the criminal sanction has no bearing on the bargaining between the Regulatory Agency and an offender. These two effects have different policy implications. The first effect pushes the regulatory penalty up for deterrence sake, whereas the second pushes it down to eliminate collusion.

There are three possibilities to consider:

(a)  $(h - z)g(z)(p(m) - q(m)) + W_m\tau > 0$ .

Notice the first term is positive and measures the relative value of both fines in deterring offenders. The second term measures the relative value of

both fines as an incentive mechanism for the Agency to increase detection (given elimination of bribing) and its sign depends on  $\tau$ .

A regulatory penalty is socially more valuable than a criminal sanction. The regulatory penalty must be maximal, and the criminal sanction is zero.

$$(b) (h - z)g(z)(p(m) - q(m)) + W_m\tau < 0.$$

It must be the case that  $\tau$  is positive, that is, the effect of the reward on enforcement ( $m_\gamma$ ) more than offsets the effect of fines on enforcement ( $m_f - m_s$ ).

A regulatory penalty is socially less valuable than a criminal sanction. From (26), the criminal sanction is maximal, but the regulatory penalty is zero. The elimination of bribing is so important that the regulatory penalty goes to zero, and a criminal sanction is introduced because of deterrence considerations.

It is not a likely outcome since the Agency's choice of enforcement is zero (because the reward is zero).

$$(c) (h - z)g(z)(p(m) - q(m)) + W_m\tau = 0.$$

Again we must have  $\tau > 0$ . Both sanctions are less than maximal (to avoid over-enforcement) and both sanctions are positive, so that  $0 < f + s \leq S$ . The regulatory penalty goes down motivated by the need to eliminate bribing. The criminal fine goes up to offset the effect on deterrence.

## 5.2 Fabrication of offenses

Fabrication of offenses is a problem when the optimal reward  $\gamma$  is higher than  $S$ . In order to eliminate fabrication of offenses, the reward will have to go down until it equals  $S$  (since the regulatory penalty cannot go up). Thus  $W_m$  will be positive meaning that too little is spent on detection (we have under-enforcement).

From (26), the first is positive and the second term is negative, so that social welfare is not necessarily increasing in the criminal sanction. There

are three possibilities to consider:

$$(a) (h - z)g(z)(p(m) - q(m)) + W_m\tau > 0.$$

A regulatory penalty is socially more valuable than a criminal sanction. The regulatory penalty could be less than maximal (to avoid under-enforcement), but the criminal sanction should be zero.

$$(b) (h - z)g(z)(p(m) - q(m)) + W_m\tau < 0.$$

It must be the case that  $\tau$  is negative, that is, the effect of the reward on enforcement ( $m_\gamma$ ) does not offset the effect of fines on enforcement ( $m_f - m_s$ ).

A regulatory penalty is socially less valuable than a criminal sanction. From (26), the criminal sanction could be less than maximal (to avoid under-enforcement), but the regulatory penalty should be zero. The elimination of fabrication is so important that the regulatory penalty (and the Agency's reward) goes to zero, and a criminal sanction is introduced because of deterrence considerations.

It is not a likely outcome since the Agency's choice of enforcement is zero (because the reward is zero).

$$(c) (h - z)g(z)(p(m) - q(m)) + W_m\tau = 0.$$

Again we must have  $\tau < 0$ . Both sanctions are less than maximal (to avoid under-enforcement) and both sanctions are positive, so that  $0 < f + s \leq S$ . The regulatory penalty goes down motivated by the need to eliminate fabrication. The criminal fine goes up to offset the effect on deterrence.

### 5.3 Monitoring the Regulatory Agency

In our model with bribing we have so far ignored the possibility of using Court cases to investigate collusion between the Regulatory Agency and offenders. When the Agency and an offender collude, there is still a probability  $q(m)$  that the offender will be subjected to criminal penalties. Suppose that if offender is found guilty in Court, the Agency's behavior will be investigated by the Government and will be punished with a fine  $t$ .

An offender is willing to pay a bribe not higher than  $f$  since in any case there is a probability  $q$  of criminal prosecution. However, the Agency wants a bribe that covers the reward  $\gamma$  plus the expected fine if criminal charges are brought (say with probability  $r(m) \leq q(m)$ ). As long as  $t \geq (f - \gamma)/r(m)$ , the Agency is deterred from accepting bribes.

The policy for the Government would be to announce a reward to induce the Agency to choose the socially optimal monitoring effort coupled with a high sanction if collusion is detected plus a maximal regulatory fine and no criminal penalty.

Criminal prosecution of an offender is useful as a mechanism to generate information to punish the Regulatory Agency for collusion, rather than to punish an offender. There could be a credibility problem with this solution of course: if the criminal sanction for an offender is zero, the Agency could perceive such announcement as Courts not getting involved, and thus  $t$  to be actually zero. Thus, the Government could have to use a low criminal sanction for an offender to signal de possibility of punishing the Agency. At the same time, the regulatory penalty would be the maximal fine minus the low criminal sanction.

A second problem with this policy is that the sanction borne by the Agency is limited by a wealth constraint, eventually the personal wealth of the enforcer. Denote the (exogenous) wealth of the enforcer by  $T$ . The sanction borne by the Agency should be  $t = T$  for the usual motives, and we would have a collusion-proof solution by imposing  $f = \gamma + r(m)T$ . As  $T$  increases, we can enlarge the gap between  $f$  and  $\gamma$  (the problem of over-enforcement is reduced) without generating an incentive for collusion.

## 6 Concluding remarks

The analysis of the use of regulatory penalties and criminal sanctions presented in the preceding sections of the paper, allows us to draw some policy implications, both for an optimal law-enforcement policy and for the scope of the Double Jeopardy clause.



## 6.1 For optimal law enforcement policy

When, for some kind of misbehavior or illegal activity, the socially optimal level of deterrence can be delegated to a Regulatory Agency, to give the Agency authority to impose penalties on the offenders is the more effective deterrence strategy for the Government. Moreover, if none of the qualifying circumstances listed below are present, there is no need to supplement the regulatory penalty with a specific criminal provision intended to sanction the same underlying illegal behavior.<sup>16</sup> However, when any of the following factors is an issue, it might be socially advisable to introduce related criminal sanctions for the relevant misbehavior.

(a) The potential offender might have insufficient assets to meet the desired regulatory penalty. And given that, for constitutional reasons, only Courts of Law following a criminal conviction can impose punishment in the form of incarceration or other type of deprivation of liberty, deterrence requires the use of criminal provisions contemplating non-monetary sanctions.

(b) Even when a Regulatory Agency is operating and has sanctioning powers in a certain field, there might be cases of violations for which the optimal level of deterrence cannot be delegated to the Agency (e.g. when complete deterrence is optimal). This might justify supplementing the regulatory penalty with a criminal sanction. When the regulatory penalty is more effective in controlling for under-deterrence, we might want reduce it in order to provide appropriate incentives to increase enforcement effort, but this requires a criminal sanction to maintain the level of deterrence.

(c) Legal decision-makers sometimes err in their judgements and sanction an innocent individual or firm - Type I error -. Although this kind of legal error is likely to affect both Regulatory Agencies and Courts, the probability of its occurrence seems higher for the former than for the latter. As a matter of fact, one can argue that the primary - albeit not exclusive - goal of the criminal trial is precisely to reduce Type I errors.

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<sup>16</sup>Our claim does not imply advocating that, because a certain regulatory violation (environmental, for instance) might result in death of a person, we should abolish manslaughter or murder from the Criminal Codes. We are referring here to specific statutory crimes, directed at punishing the regulatory violation as such.

In this case,

(c1) If there are no costs associated with error other than the erosion of deterrence, our model does not reveal good reasons for the combined use of regulatory penalties and criminal sanctions: It is socially desirable to have only the regulatory penalty when it has a more important deterrent effect than a criminal sanction. If the reverse is true, we don't want a combination of both sanctions, but only the criminal conviction.

(c2) If, on the contrary, there are costs arising out of sanctioning the innocent (loss of well-gained reputation by a firm, ostracism on the sanctioned individual, demoralization of the citizenship), and the difference in cost of legal error is not so big as to always offset the deterrent advantage of using a regulatory penalty -because in this case we only desire the criminal sanction-, then we might want to reduce the regulatory penalty to decrease the expected cost of legal error . The optimal strategy to maintain deterrence is through an increase in the criminal sanction.

It seems unlikely to us that in the real world legal error will justify the combination of both types of sanctions in many circumstances, due to the fact that the size of the cost of miscarriage of justice will probably be higher for the criminal conviction -more shame associated with it, even if it is only monetary and affects a firm-, and often much higher -stigma linked to imprisonment when the criminal conviction leads to incarceration-.

(d) When the size of the reward for the Agency does not coincide with the size of the penalty the offender faces if detected, there is ample room for collusive dealing between the two of them. In other words, when corruption is an issue, our main result might be substantially altered

(d1) When the Agency's reward is collusion-proof, under certain conditions, we want a combination of sanctions because: optimal reward is less than the entire wealth , and then to achieve a collusion proof reward we need to increase reward and/or reduce sanction, which implies an increase in the level of enforcement, so that we have excessive enforcement effort (over-enforcement). Then, to reduce it and maintain deterrence, it is socially desirable to have a criminal sanction.

(d2) When the Agency's reward is not collusion-proof, there will be collusion between the Agency and offenders. A criminal sanction is socially desirable to offset dilution of deterrence.

## 6.2 For the scope of Double Jeopardy Protection

In our setting, Double Jeopardy becomes an issue when, in fact, a given statutory violation might result both in regulatory penalties and criminal sanctions. When only one or the other is forthcoming as the expected sanction, life, limb and assets can be put in jeopardy just once, and the scope of the Double Jeopardy clause is of no relevance. The findings of our model tend to support an interpretation of the Double Jeopardy clause as giving protection against double punishment be it in the form of a regulatory penalty or a criminal sanction. So, contrary to what is currently the position of the US Supreme Court<sup>17</sup>, our claim is that, absent any qualifying factors, once a regulatory penalty has been imposed, an additional criminal conviction should be barred, and vice-versa. Moreover, our model allows us to identify several factors affecting the preference for one or the other type of sanction.<sup>18</sup>

In principle, regulatory penalties seem to be more effective for deterrence and should be preferred. The opposite holds when (a) Optimal enforcement cannot be delegated to the Agency, and the advantage of using a criminal sanction with regard to the level of under-enforcement exceeds the comparative advantage of a regulatory penalty with respect to effectiveness, (b) There is a significant chance of legal error, and the advantage of the criminal trial in preventing it exceeds the difference in effectiveness, (c) When there is the possibility of corruption, but the Government has set a collusion-proof reward, the criminal sanction is preferred over a regulatory penalty if the relative advantage of the former in reducing over-enforcement by the Agency

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<sup>17</sup>*Hudson v. US* (1997).

<sup>18</sup>To our knowledge, in the US the Double Jeopardy clause does not play a role in deciding which type of sanction should prevail. It only protects the offender against multiple punishments. In several European legal systems, on the contrary, the *Non bis in idem* principle, under the somewhat misleading heading of *procedural Non bis in idem*, awards preference to the criminal sanction. In the world of our model, it is clear that this unqualified and general preference for the criminal conviction makes no sense.

more than offsets the relative advantage of the latter in terms of effective deterrence, (d) When the issue is fabrication of offenses, and the Government has to reduce the reward, the criminal sanction is preferred over regulatory enforcement when the relative advantage of the former regarding enforcement more than offsets the deterrence superiority of the latter.

The analysis presented in the paper, however, should not be interpreted as an unqualified defense of a broad - as long as it includes sanctions that are non-criminal in nature - interpretation of the Double Jeopardy clause. It is important to keep in mind that there are circumstances in which it is sensible to impose both sets of sanctions, and therefore, to deny Double Jeopardy protection:

(a) If the optimal regulatory penalty exceeds the wealth constraint of the offender, imprisonment following a criminal conviction should be allowed.

(b) When there is likelihood of legal error, and it will be costly in social terms, it is sensible to reduce the regulatory penalty and have a criminal sanction (which is more reliable in terms of error and, in a setting of purely monetary sanctions, might be not much more costly in terms of miscarriage of justice). The Court could then reduce the regulatory penalty and, if decides conviction, impose the criminal sanction. Contrary to the standard legal reasoning<sup>19</sup>, the shamefulness of the regulatory penalty *ceteris paribus* weights in favor - because it increases the cost of miscarriage of justice for the regulatory penalty - and not against allowing the double sanction,

(c) When there is room for collusion, the regulatory penalty is too low (either because there is bribing or because this is the way to eliminate the possibility of collusion), and a criminal sanction should be used to maintain deterrence.

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<sup>19</sup>See the US Supreme Court decisions on this issue.

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